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1.0 OHIO SITES URANIUM MASS BALANCE PROJECT

The Ohio Field Office Recycled Uranium Project Report has been developed to support the development of a complex wide report by DOE-HQ. This section of the Ohio report documents the role the Ohio report plays in the overall Mass Balance Project and the involvement of the Ohio sites' team with the other sites in the DOE Complex.

1.1 PROJECT OVERVIEW

This document discusses the flow of uranium that has occurred throughout the operational history of:

- Fernald Environmental Management Project (FEMP), formerly referred to as the Feed Materials Production Center;
- Reactive Metals, Incorporated (RMI);
- West Valley Demonstration Project (WVDP); and
- Weldon Spring Site Remedial Action Project (WSSRAP), formerly processed at the Mallinckrodt Chemical Works (MCW) downtown facility;

This report addresses historical flows of recycled uranium between these facilities, other DOE and predecessor agencies, and other nuclear facilities.

The overall objective of the DOE mass balance project entitled Historical Generation and Flow of Recycled Uranium in the DOE Complex (RU-DOE) is to identify where recycled uranium could have created an exposure hazard to workers and to estimate the numbers of workers potentially exposed. In addition, the key sites associated with the flow of recycled uranium have been requested to identify and estimate potential significant contamination of the environment resulting from processing and handling recycled uranium. The completion of the complex-wide project requires the major DOE processing facilities that handled recycled uranium to research, evaluate, and document the reconstructed flow of recycled uranium.

As one of the major DOE facilities involved with the receipt, shipping and processing of recycled uranium materials, the Fernald Environmental Management Project (FEMP) has been requested to lead the compilation and development of a consolidated Recycled Uranium Project report for the DOE Ohio



Field Office (DOE-OH). The efforts of this integrated compilation of historical data and process knowledge are presented herein for the following four sites:

- Fernald Environmental Management Project in Fernald, Ohio
- Reactive Metals, Incorporated facility in Ashtabula, Ohio
- West Valley Demonstration Project in West Valley, New York
- Weldon Spring Site Remedial Action Project in the greater St. Louis, Missouri area.

Although not within the DOE-OH reporting chain, the WSSRAP is included in this document due to the similarity of their operations to Fernald and absence of personnel and records to generate a viable report.

As part of this effort, a team of DOE and DOE contractor employees was assembled at FEMP, RMI, WVDP, and WSSRAP to characterize the relative hazards of uranium process streams and to prepare a study of historical flows of uranium within and between past and present DOE facilities. Key aspects addressed for the four sites addressed within this report include:

- Identification of the mass flow of recycled uranium to and from the subject sites.
- Identification of the transuranic and other key contaminant constituents within the recycled uranium mass flow for the subject sites.
- Completion of site-specific mass balance activities to identify health, safety, and environmental concerns for the subject sites.

1.2 PURPOSE AND SCOPE

This project reviews irradiated, recycled uranium generated and processed by DOE and its predecessor agencies (AEC and ERDA) over the last 50 years. The four facilities detailed in this report were identified as a subset of the twelve key domestic sites that handled/processed recycled uranium in the RU-DOE Project Plan issued by DOE-HQ in February 2000. The information and data presented within this report will be utilized by DOE-HQ to compile a complex-wide report delineating and discussing the flow of recycled uranium and its potential impact to workers and the environment. The RU Project at the FEMP essentially began in late August 1999, with a conference call that was the direct result of an announcement by Secretary of Energy Richardson on August 8, 1999. This announcement indicated that a "...comprehensive set of actions to address the issues at the Paducah Gaseous Diffusion Plant..." would be undertaken. These issues grew out of a lawsuit filed on behalf of current and former workers at Paducah alleging health impacts from plutonium and other transuranics and fission products contained in the uranium handled at the site. The conference call was the initial indication that the FEMP and the other sites had critical information related to the quantity and composition of recycled uranium within the DOE complex.



Subsequent to this conference call, Deputy Secretary of Energy T. J. Glauthier issued a formal memorandum, dated September 15, 1999, that provided additional guidance and detail as to the overall mission related to the uranium recycle project. The RU-DOE Project Plan was developed and issued from DOE-HQ that identified goals, objectives, and proposed schedules for completing the tasks. The overall objective is to produce site reports that would then be rolled up into a DOE-HQ report to be delivered to the Secretary of Energy by June 1, 2000.

Uranium was used in DOE production reactors to produce plutonium for weapons. Both the plutonium and uranium were recovered. The uranium was returned (hence the term, recycle) to the enrichment and/or feed processing facilities to make new fuel for the reactors. Enrichment occurred at the Gaseous Diffusion Plants located at Paducah, Oak Ridge, and Portsmouth, which converted the incoming uranium to uranium hexafluoride (UF_6). Conversion to metal and blending for reactor fuel or targets was conducted at Fernald, Weldon Spring, and the Oak Ridge Y-12 Plant.

Because no separation process is 100 percent effective, the recycled uranium sent from the chemical separations facilities contained trace amounts of residual transuranic elements (including neptunium and plutonium), fission products (such as technetium), and reactor-produced uranium isotopes (such as uranium-236). The presence of these constituents in the recycled uranium stream makes it more radioactive than natural uranium, thus the initiator for the health and environmental concerns with recycled uranium.

From the start of its use by DOE and its predecessor agencies – the Manhattan Project, the Atomic Energy Commission (AEC), and the Energy Research and Development Administration (ERDA) – over 100,000 metric tons of recycled uranium were processed. This material was sent to many locations throughout the country for various purposes.

As a result of the aforementioned Paducah workers lawsuit, DOE formed an investigative team to specifically respond to the workers' concerns and to address potential environmental contamination from recycled uranium. DOE needs to have a sufficiently thorough understanding of the mass flow and characteristics of this recycled material in order to assess the potential for health or Environmental contamination issues.



1.3 PROJECT IMPLEMENTATION STRATEGY

The RU-DOE Project Plan indicates that a "working group" concept will be utilized to compile, evaluate and document the flow of recycled uranium within the complex. This "working group" concept was adopted and employed by the FEMP Recycled Uranium Project team for the development of this document. The DOE Ohio Field Office Recycled Uranium Project Report was researched and written through the integrated efforts of a team of knowledgeable personnel at the FEMP, RMI, WVDP and WSSRAP. In addition, key FEMP project personnel participated in data exchange and data transfer sessions with personnel from the other primary DOE processing facilities including Hanford, Savannah River, Portsmouth, Paducah, Oak Ridge and Idaho.

During the December 1999 Albuquerque meeting, a side meeting was held among the site representatives of the two major cycles. At that time it was decided to have coordination meetings with key site technical and Material Control and Accountability (MC&A) personnel from each of the fuel cycles. The first meeting was the Hanford fuel cycle sites – Hanford, Paducah, K-25, and Fernald. The sites compared both shipper/receiver data and constituent chemistry data. The second meeting was the Savannah River fuel cycle sites – Savannah River, Y-12, and Fernald. Additional contacts have been coordinated with Rocky Flats and Idaho Falls. These meetings facilitated the exchange of data, filling data gaps from stored records, further elaborating of material types not specified on MC&A records.

The FEMP Recycled Uranium Project team is comprised of current and former site employees focused on the re-construction and evaluation of historical operations data and process knowledge to support the development of this report. The core FEMP team includes project leads from the DOE-Fernald Office and senior technical staff of the site contractor, Fluor Fernald. This core team has been supplemented by the addition of former FEMP operations technical staff to provide process knowledge support and site historical perspective. The research and reconstruction of historical receiving and shipping information has been compiled using the FEMP MC&A databases. This database has been audited for accuracy and completeness and carefully scrutinized by both the FEMP project team and by other key facilities project teams.

Information and data for the other three facilities included in this report was initially compiled and documented by DOE and contractor personnel at the representative site and forwarded to the Fernald team for incorporation into the combined DOE-OH report. During the compilation of data and text from these three sites into the report, FEMP team members filled data gaps and corrected report discrepancies using FEMP site historical shipping and receiving records.



The text and data contained in the following sections of this report has been compiled from the best available data sources at the four sites. The initial emphasis of the Fernald team was on assembling, reviewing, and evaluating historical shipping and receiving data and on estimating/calculating the level of constituents of concern in these materials. Work on this area of the report is complete and is, as presented herein, accurate for its use in the RU-DOE summary report. The next activity undertaken by the Fernald team has been to document and explain the compiled data into an integrated document that addresses the key topics and areas of discussion required by the DOE-HQ Project Plan Appendix B, Site Report Outline. The DOE-HQ Working Group reviewed the Ohio Field Office Recycled Uranium project Report (draft Final) during the week of April 25, 2000 and provided comments for incorporation into this report. FEMP project team personnel, supported by the appropriate personnel from the other three sites addressed in this report, incorporated these comments and have published this final report.